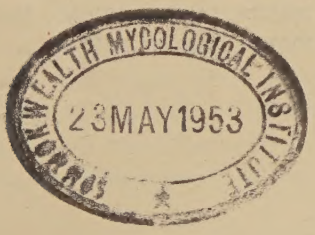
PROGRESS REPORTS

FROM

EXPERIMENT STATIONS

SEASON 1951-52

SOUTHERN RHODESIA



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SOUTHERN RHODESIA

COTTON RESEARCH STATION, GATOOMA

PROGRESS REPORT FOR THE SEASON 1951-52

BY

R. W. JAMES.

Planting period: 6th-15th November 1951. Replanting 5th-13th December.
Flowering: Commencing late January, mainly February and March.
Picking: April, May to middle June.
Legal uprooting date: 1st October 1952.

METEOROLOGY.

The total rainfall for the season was 40·67 inches. The season commenced on 15th October 1951.

Falls were consistently good and well spaced up to 10th November, when a dry spell of 17 days ensued. From 27th November 1951 to 1st March 1952 only 32 dry days occurred and at no time did a dry period last longer than 8 days. The season ended abruptly on 1st March 1952 with a fall of 1·16 inches.

Planting commenced on 6th November and was completed on 15th November. Unfortunately, the only serious dry spell of the season occurred at this time and germination was patchy in the machine planted fertilizer trials. Several of these were replanted by hand between 5th and 13th December. Cultivation and weeding were retarded owing to the heavy rains and short dry spells.

PLANT BREEDING.

Blackarm Grading.—The following strains were received from Dr. R. L. Knight to provide material on which it was hoped that a blackarm grading system could be built up for Rhodesian conditions:—

Resistance Genes.				*Strains.*
B_2	B_2	B_3	B_3	BAR 7/8; BAR 13/1.
B_2	B_2	b_3	b_3	BAR 7/3; BAR 12/3; BAR 12/9; BAR NT96/40.
b_2	b_2	b_3	b_3	XA 129; SUS 16/1; SUS 7/2.

The strains were grown in replicated observation plots and were sprayed with suspensions of *X. malvacearum* prepared from Agar cultures of the

bacterium; they were later inoculated by Wickens' needle prick method. (E.C.G.C. Progress Reports 1950-51, p. 14). There were no apparent differences in reaction to the disease between these genotypes when infected by either method, and consequently no grading system could be devised.

On the other hand, however, two small bulks of Albar 49 grown from seed received from Dr. J. B. Hutchinson and Mr. H. C. Ducker and treated at the same times, and by the same methods as the above strains, generally showed no symptoms of the disease. A few plants which did react were obviously off-type, and were removed.

Hybridization.—This season a large number of crosses were made between MU8A × $BP52^2$ selections and Albar 49, commencing a programme designed to transfer blackarm resistance to quality linted strains. The first backcrosses to the MU8A × $BP52^2$ parents will be made in the coming season.

9L34 Modal Bulk.—The U4 strain, 9L34, has now been in commercial cultivation for 10 years without any re-issue of seed from this Station. As it is now unlikely that a new strain can be issued for commercial cultivation within the next eight years an attempt has been made to stabilize the strain by the formation of a modal bulk. 560 single plant selections with good jassid resistance and other field characters were examined in the laboratory. 171 were finally selected to form the modal bulk. Means for the bulk were: 9·03 centigrams for seed index with a coefficient of variation of 9·0%; 4·64 centigrams for lint index with a coefficient of variation of 5·0%; and 25·5 mm. for fibrograph upper ½ mean lint length with a coefficient of variation of 5·4%.

Agriculture.

Fertilizer Experiments.—Ten 3 × 3 × 3 factorial experiments and one randomized block experiment were laid out this season. In all these experiments the commercial strain, 9L34, was planted.

Two of the factorial experiments, which were sited on a nearby farm on sandveld, unfortunately became very badly water-logged and had to be abandoned.

In seven of the remaining eight factorial experiments sited on the Station significant differences were obtained. Owing to heavy rains, however, three of these, involving the side application of nitrogen at predetermined dates from germination, could not be carried out according to plan. As applications were delayed on the average by 40 days no useful purpose would be served in reporting the results in detail.

Two experiments performed on virgin soil gave practically identical results. Therefore, only one of these (experiment 4) is reported.

The levels of fertilizer applied were altered this season to pounds of nutrient per acre.

N_0 = Nil	P_0 = Nil	K_0 = Nil
N_1 = 20 lb. N/acre	P_1 = 35 lb. P_2O_5/acre	K_1 = 50 lb. K_2O/acre
N_2 = 40 lb. N/acre	P_2 = 70 lb. P_2O_5/acre	K_2 = 100 lb. K_2O/acre

Unless otherwise stated the fertilizers were placed in a band 2½" to one side and 3" below the level of the seed at planting.

The two fertilizer experiments reported last year (E.C.G.C. Progress Reports, 1950-51, p. 100) were repeated with altered levels (see above) this season on land which had been in continuous cultivation for 27 years. Both these experiments, the results of which are given in Tables 1 and 2, were of the factorial 3 × 3 × 3 design in 6 blocks of 9 plots each. The plot size was 0·0046 hectare.

TABLE 1.

EXPERIMENT NO. 1: NUTRIENT APPLIED AND YIELD OF SEED COTTON IN LB./ACRE.

N as nitrate of soda 16% N.	*P as superphosphate* 19% W.S. P_2O_5			*K as muriate of potash* 60% K_2O			*Mean*
	P_0	P_1	P_2	K_0	K_1	K_2	
N_0	367	433	402	366	461	375	400
N_1	450	461	495	427	399	580	469
N_2	362	416	402	363	394	422	393
Mean	393	436	433	386	418	459	421

P as superphosphate 19% W.S. P_2O_5	*K as muriate of potash* 60% K_2O		
	K_0	K_1	K_2
P_0	380	373	426
P_1	398	438	473
P_2	378	443	378

Standard Errors:
of means (means of 18 plots) = ± 23·5 lb.
of cell figures (means of 6 plots) = ± 40·7 lb.

Significant Differences: P<0·05
of means = 69 lb./acre
of cell figures = 119 lb./acre

TABLE 2.

EXPERIMENT NO. 2: NUTRIENT APPLIED AND YIELD OF SEED COTTON IN LB./ACRE.

N as sulphate of ammonia 21% N.	*P as superphosphate* 19% W.S. P_2O_5			*K as sulphate of potash* 48% K_2O			*Mean*
	P_0	P_1	P_2	K_0	K_1	K_2	
N_0	440	424	562	333	554	539	475
N_1	511	558	619	493	616	580	563
N_2	564	610	600	471	644	659	591
Mean	505	531	594	432	604	593	543

P as superphosphate 19% W.S. P_2O_5	*K as sulphate of potash* 48% K_2O		
	K_0	K_1	K_2
P_0	364	576	576
P_1	447	607	538
P_2	486	631	664

Standard Errors:
of means (means of 18 plots) = ± 24·3 lb.
of cell figures (means of 6 plots) = ± 42·1 lb.

Significant Differences: P<0·05
of means = 71 lb./acre
of cell figures = 123 lb./acre

A randomized block experiment in 6 blocks of 7 plots each, with a plot size of 0·0046 hectare, was also laid down to compare different methods and times of application of sulphate of ammonia, superphosphate and muriate of potash against broadcast compost harrowed in. The levels of nutrient applied were:—

N = 20 lb. N/acre; P = 35 lb. P_2O_5/acre; K = 50 lb. K_2O/acre.

TABLE 3.

EXPERIMENT NO. 11:

Treatment	*Yield lb. S.C./acre*	*Yield % of control*
Control	306	100
Sideplaced P at planting + sidedressed N & K at 68 days	394	129
N, P & K broadcast and harrowed in before planting	398	130
N, P & K placed in the same drill as the seed at planting	407	133
Sideplaced P + K at planting + N sidedressed at 68 days	432	142
Compost at 5 tons/acre. Broadcast and harrowed in before planting	462	151
N, P & K sideplaced at planting	462	151
Mean	409	134
Standard Error (mean)	± 33·0	± 10·8
Significant Difference P<0·05	95	31

A third experiment of factorial 3 × 3 × 3 design, but using N levels as different times of application, instead of different weights, was laid down on virgin soil.

TABLE 4.

EXPERIMENT NO. 4: NUTRIENT APPLIED AND YIELD OF SEED COTTON IN LB./ACRE.

N as sulphate of ammonia 21% N.	*P as superphosphate* 19% W.S. P_2O_5			*K as muriate of potash* 60% K_2O			*Mean*
	P_0	P_1	P_2	K_0	K_1	K_2	
None	378	517	580	477	481	518	492
20 lb. N @ 7 days	368	559	608	523	488	525	512
20 lb. N @ 35 days	390	572	632	503	524	568	531
Mean	379	549	607	501	498	536	512

P as superphosphate 19% W.S. P_2O_5	*K as muriate of potash* 60% K_2O		
	K_0	K_1	K_2
P_0	347	375	415
P_1	518	548	582
P_2	638	570	613

Standard Errors:
of means (means of 18 plots) = ± 13·1 lb.
of cell figures (means of 6 plots) = ± 22·6 lb.

Significant Differences: P<0·05
of means = 38 lb./acre
of cell figures = 66 lb./acre

The results of these experiments, together with those not reported in detail here, and those performed during the previous two seasons, have led to the following general recommendations for the use of artificial fertilizers on cotton grown in the red soil areas of Southern Rhodesia: —

(1) Fertilizer should be placed in a band 2½″ to one side and 3″ below the seed level at planting.

(2) On new or second year land, or land in a high state of fertility either: —
(a) 400 lb./acre of a compound fertilizer with an N: P_2O_5: K_2O ratio of 2 : 12 : 3.

or (b) 350 lb./acre of super and raw rock phosphate analysing 14% water soluble P_2O_5.

(a) is preferred as it is a compound fertilizer.

(3) On land which is in a poor state of fertility after continuous cropping for a number of years: 300 lb./acre of a compound fertilizer with an N: P_2O_5: K_2O ratio of 6 : 18 : 12.

In both compound fertilizers the N should be in the form of sulphate of ammonia.

No recommendations are made for sandveld as no experiments have been performed on this type of soil.

Cotton Pests.

An insecticide experiment, carried out in co-operation with Messrs. Pest Control (Central Africa) Ltd., was laid down on second year land, treated with compost ploughed in at 5 tons per acre. The object was to compare the action of four insecticidal preparations each at medium-high and low volume applications, on the major insect pests of cotton in Southern Rhodesia, i.e. red and American bollworm, stainers and aphis. The eight treatments were applied to plots which had (a) been fertilized at planting by the side placement method with 300 lb. super and raw rock phosphate per acre, or (b) received no artificial fertilizer.

The experiment was designed in randomized blocks with four replications of 20 treated plots per block plus 22 unsprayed intermediate plots. Eleven of the 22 unsprayed intermediate plots per block were randomized for fertilization. The plot size of 6 rows one metre apart and 50 metres long =

0·03 hectare. Treated plots and controls were separated from one another by untreated intermediate plots to allow a normal spread of insects over the area of the experiment. At reaping, 5 metres were discarded from each end of each plot and only the two centre rows were reaped for yield analysis. The size of plot reaped was, therefore, 0·008 hectare.

The treatments used were:

DDT = Psylortox 250 (25% DDT Tech.) applied at a rate of 1·25 lb. DDT Tech./acre/application.

Parathion = Σ 605 (46·6% active ingredient) applied at a rate of 2·5 oz. active ingredient/acre/application.

Pestox 3 = Pestox 3 H applied at a rate of 30 ccs. per gallon of liquid/acre/application.

Medium-high volume = 70-80 gallons/acre/application.

Low volume = 9-12 gallons/acre/application.

A first analysis of the experiment showed that there was no evidence that either high vs. low volume or fertilizer vs. no fertilizer had any effect on yield. The lack of response to fertilizer was probably due to the effect of compost ploughed in prior to planting. (See also Experiment No. 11, 1951-52).

Bartlett's test for the homogeneity of variances was applied to the combined data for each insecticidal treatment and the controls plus the unsprayed intermediate plots. This test showed that the variances were homogeneous and could be compared by means of an analysis of variance.

The results of this analysis of the experiment are reported in Table 5.

TABLE 5.

Insecticide	*Number of applications*	*Number of plots*	*Mean yield lb. S.C./acre*	*% of control*
DDT + Pestox 3	1	16	1060	119
DDT + Parathion	2	16	1022	114
DDT	1 or 2*	24	920	103
Control	—	96	893	100
Pestox 3	1	16	874	98
General mean			954	107
Significant difference between means of 16 plots each		P<0·05	94	10·5
		P<0·001	157	17·6
Significant difference between means of 16 and 96 plots		P<0·05	72	8·1
		P<0·001	120	13·4

*Some DDT plots received one, others two applications.

At present price levels, 160 lb. trash free seed cotton (G.M/VLS) would be valued at approximately £7 6s 0d and 120 lb. at £5 9s 0d. The cost of the insecticides and their application, combined with the cost of picking the extra seed cotton produced, amounted to approximately £2 15s 0d and

£5 9s 0d for DDT + Pestox 3 and DDT + Parathion respectively. It would therefore have been economic to apply DDT + Pestox 3, but not DDT + Parathion, to composted cotton under the conditions of this experiment.

Mechanical Picking.

A total of 14,294 lb. Picker Class seed cotton was harvested from a bulk of 23·4 acres of 9L34 in 1952. This represents a yield of 611 lb. per acre Picker Class seed cotton.

In addition to the 14,294 lb. a further 863 lb. 'P.C.' seed cotton was harvested from smaller acreages. Thus a total of 15,157 lb. Picker Class seed cotton was available for ginning in the newly erected Murray air-blast ginnery.

On ginning, the total trash and invisible losses were 8·4% while the losses in the blowroom and on the cards amounted to 11·25%. For comparison with the latter figure, Shirley Analyser losses were 11·3%. Correspondingly, Shirley Analyser losses for Class IA hand picked cotton were about 5·4%.

The 1952 blowroom and card losses are nearly 12% below those of 1951, when the mechanically harvested crop was ginned in the twenty-eight year old Platts Ginnery, which is not equipped with pre-ginning cleaning machinery.

The ginning percentage was 30·5%. Therefore the yield of Picker Class *spinnable* lint, available after the card stage, calculated on the basis of 611 lb. 'P.C.' seed cotton per acre was approximately 165 lb. 'P.C.' lint per acre.

The Picker Class lint was graded as "Strict Low Middling", which is three grades lower than the grading of lint from Rhodesian Class I hand picked cotton.

The yarn spun from the mechanically picked lint gave a count × strength product of 1863 at 14's twist. In appearance the yarn was described as hairy with fairly numerous specks of trash, etc.

Part of the acreage harvested was defoliated quite successfully with "Shed-a-Leaf", a spray defoliant, which is at present obtainable only from American sources.

Received December 1952.